INSTRUCTION MANUAL

Orion® StarShoot™ HD Video/ Web Broadcasting Camera

#52099

ORION
TELESCOPES & BINOCULARS
Providing Exceptional Consumer Optical Products Since 1975

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Figure 1. The SSHD attached to telescope for solar system imaging.

Congratulations on your purchase of the Orion StarShoot HD Video/Web Broadcasting Camera (**SSHD**).

The **SSHD** is a high resolution color video camera designed for Real-Time Live observation of solar system objects (Moon, Planets and Sun with solar filter and limited bright deep space objects).

The **SSHD** outputs analogue **SD** Video (**CVBS**) for standard TV's in **NTSC** or **PAL** region formats.

The **SSHD** also outputs digital uncompressed **HD** Video (**HD-SDI**) up to 1080p resolution for HD TV's and Projectors in **HDMI** format.

The **SSHD** also outputs digital uncompressed **HD** Video (**HD-SDI**) for Broadcast industry compliance **SMPTE 292**.

The **SSHD** can be used for the following purposes:

- Lunar Imaging
- Planetary Imaging
- Solar Imaging
- Limited Deep Space Imaging (Bright Objects)
- Terrestrial Imaging

A computer is not required to use the **SSHD** as the manual buttons on rear of camera controls all functions. However the included camera control software enables a much more convenient method to control the **SSHD** camera features by use of buttons, sliders and drop down menus.

The included video capture device enables the user to view and capture live video in SD format on their computers.

Together with the video capture device the **SSHD** can be setup to broadcast live video over the internet using services such as nightskiesnetwork.com

Parts List

- Orion StarShoot HD Video Camera (SSHD)
- 1.25" Nosepiece
- HDMI Convertor box and control cable (AUX)
- 24V Power Adapter
- 50ft serial extension cable
- 50ft BNC cable
- 50ft RCA cable
- 20ft HDMI cable
- BNC to RCA adapter
- USB to RS-232 Adapter
- USB Video Capture device
- Capture and Control software
- Manual

Video Resolution

The **SSHD** outputs both High Definition (**HD-SDI/HDMI**) video as well as Standard Definition (**SD/CVBS**) video. The included **HDMI** convertor box converts the **HD-SDI** signal into a **HDMI** signal so that the output can be used on standard HD-TV's and HD-Projectors.

The HD and SD signals are outputted at the same time which gives the user the benefit of having an SD viewing device near the camera and telescope for focusing and at the same time have the ability for the HD/HDMI viewing or recording device to be located elsewhere.

For example a telescope could be placed outside with a small TV, Laptop or Orion LCD-DVR (sold separately) for focusing while inside the audience could be watching the HD signal on HD-TV or HD-Projector in the comfort of their own home.

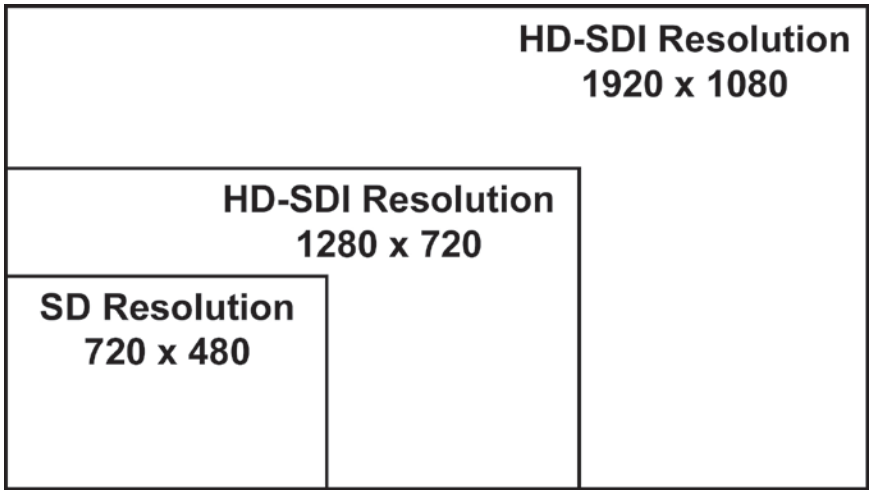


Figure 2. Standard Definition (SD) video resolution compared to High Definition (HD) video resolution.

The HDMI output can be used on a computer monitor with Digital input (**DVI**) by using a standard HDMI to DVI adapter (not included).

Viewing on TV

Users have the option to view in **HD** or **SD** or **BOTH** at the same time.

The **SSHD** uses a one cable solution in order to provide power, computer control (RS-232) and HD video signal from the **SSHD** to the HDMI Convertor box. This not only simplifies connections but also reduces weight on the camera and hence the telescope.

An additional RCA cable (included) is used for the SD video signal.

See **Figure 20** for cables types.

See **Figure 21** for HDMI convertor box connections.

In order to view on a HD TV or HD Projector (HD):

- Connect one end of BNC cable to HD-SDI output on back of SSHD.
- Connect other end of BNC cable to the HD-SDI IN on the HDMI Convertor box.
- Connect HDMI cable to HDMI Convertor box and HD-TV or HD-Projector
- Connect 24V power adapter to HDMI Convertor box.
- The red LED on camera will light up to show that the camera is receiving power.

Video will now be seen on HD-TV screen.

In order to view on a standard TV (SD):

- Connect one end of BNC cable to HD-SDI output on back of SSHD.
- Connect other end of BNC cable to the HD-SDI IN on the HDMI Convertor box.
- Connect 24V power adapter to HDMI Convertor box.
- The red LED on camera will light up to show that the camera is receiving power.
- Connect RCA cable to SSHD by connecting RCA cable to CVBS output using RCA to BNC adapter.
- Plug opposite end of RCA cable into TV RCA input.
- Select RCA input channel on TV.

Video should now be seen on TV screen.

Viewing on Computer or Laptop in SD

In order to view and capture video in SD (720x480) on computer or laptop first install drivers and capture software for the included video capture device (see capture device instructions for details).

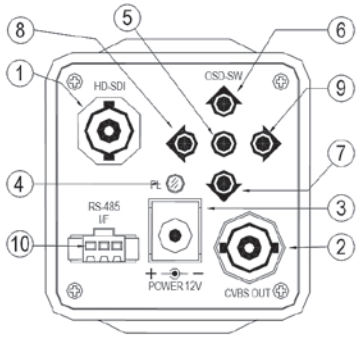
- Follow previous instructions to view on standard TV (SD) with the exception that the RCA output cable should be plugged directly into the video capture device video input (yellow plug) instead of a TV.

Figure 3. TV as a displaying device.

Viewing on Computer or Laptop in HD

In order to view and capture video in HD (720p/1080p) on computer or laptop a HD capture device must be used. We recommend the Orion HD Video Capture Device (Sold separately).

Figure 4. Laptop as a displaying/ capture/broadcasting device.



1. HD Video Out (SDI)
2. SD Video Out (CVBS)
3. Power In DC-Jack (disabled – power comes from BNC cable instead)
4. Power On LED
5. "Center" Button
6. "Up" Button
7. "Down" Button
8. "Left" Button
9. "Right" Button
10. RS-485: not used – control comes from BNC cable instead)

Figure 5. Rear of Camera

Operating Without a Computer

Camera Settings using buttons

The **SSHD** can be operated via computer software or alternatively manually by using the buttons on the back of the camera. This option is beneficial for those who do not wish to use a computer.

Using camera buttons

Press and hold center button to activate menu options.

Press left, Right, Up and Down to select and adjust.

Press exit to leave.

See section SSHD Manual Menu for available menu options

Selecting Video Format for Your Country (SD TV Signal)

For standard TV there are 3 main broadcasting formats **NTSC**, **PAL** and **SECAM** (**Figure 6**).

The **SSHD** can output **NTSC** or **PAL** TV signals from the **SD/CVBS** output.

For North America select **NTSC**.

For United Kingdom, Republic of Ireland, Australia, majority of European countries and China select **PAL**.

For **SECAM** countries some SECAM TV's will also accept a **PAL** signal otherwise either **NTSC** or **PAL** can be viewed and recorded on PC using the included Video Capture Device.

See Region Map for all other countries (**Figure 6**).

Figure 6. Worldwide TV formats

NTSC/PAL TV System Selection

- For NTSC, turn on the power while pressing the [UP] button.
- For PAL, turn on the power while pressing the [RIGHT] button.

Enabling or Disabling SD and HD Video Output

HD/SD (enable/disable):

- For **HD** enable or disable, turn on the power while pressing the [**LEFT**] button,
- For **SD** enable or disable, turn on the power while pressing the [**DOWN**] button.

Show Basic system setting:

- Turn on the power while pressing the [**CENTER]** button.

Note: Other camera controls are found via the On Screen Display Menu (OSD) using the manual buttons or by using the computer control software. See relevant sections for details.

Operating With a Computer

First install the Camera control software from CD. Future updates will be available on the product support page on the Orion website.

- Connect control cable to HD Convertor box AUX port.
- Connect serial extension cable to control cable and HD Convertor box.
- Connect other end of serial cable directly into COM port on computer.

- If no COM port exist on computer (such as the case in most laptops) then use included USB to RS-232 adapter and drivers. See the USB to Serial device manual for details.
- Run HD Camera control software.
- Select COM PORT (number will vary according to your computer see below) and select open COM Port (**Figure 7**).
- The SSHD can now be controlled via computer.

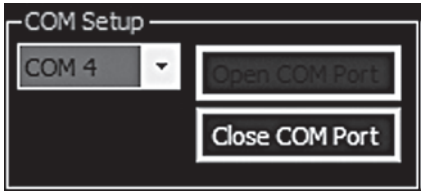


Figure 7. Com Port settings.

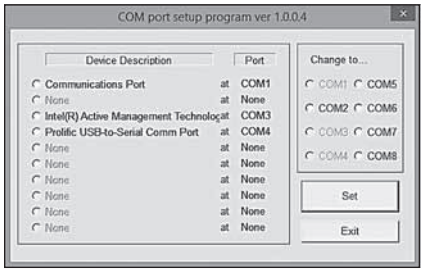


Figure 8. SetCOM.exe tool.

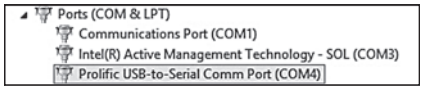

Ports (COM & LPT)
Communications Port (COM1)
Intel(R) Active Management Technology - SOL (COM3)
Prolific USB-to-Serial Comm Port (COM4)

Figure 9. Com Port settings.

Please note no menu options will function until the camera control software has a valid open COM port. Once a valid COM port has been opened, the menu options will activate allowing user selection.

The COM port number can be located using either SetCOM.exe tool (**Figure 8**) provided on the USB to Serial device CD or by looking at the COM setting of the USB to serial adapter (Prolific) from within Device Manager (Windows) (**Figure 9**).

The SetCOM.exe tool also provides a convenient way to reassign the device to another COM Port.

Computer Control Software

Select the tabs at the top of the submenus to navigate between submenus (**Figure 10**).

Setup Menu

Display Control (Figure 11)

SDV Display Mode

Select SDV Display mode to suit your TV from the following drop down menu choices:

- 4:3

Figure 10. Submenus.

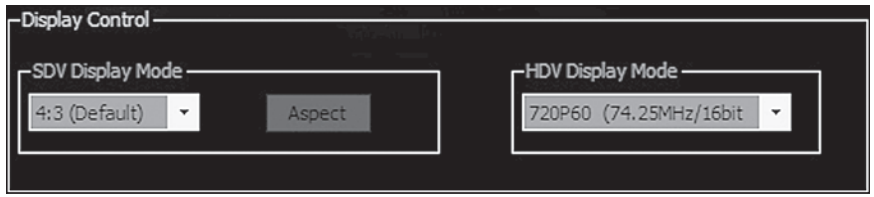


Figure 11. Display Control.

HDV Mode	Frame Rate	Resolution	Bit Depth	Scan
720P60 (74.25MHz/16 bit)	60 FPS	1280 x 720	16 bit	Progressive
1080P30 (74.25MHz/16 bit)	30 FPS	1920 x 1080	16 bit	Progressive
720P30 (74.25MHz/16 bit)	30 FPS	1280 x 720	16 bit	Progressive
720P30 (37.125MHz/16bit)	30 FPS	1280 x 720	16 bit	Progressive
720P30 (74.25MHz/8 bit)	30 FPS	1280 x 720	8 bit	Progressive
1080i60 (74.25MHz/16 bit)	60 FPS	1920 x 540	16 bit	Interline

Figure 12. HDV display modes.

- Full
- Wide

Aspect button – Toggles aspect ratio

HDV Display Mode

Select from the 6 available HDV Display modes to best match users viewing or recording devices. For best results we recommend either the largest resolution 1080P30 mode or 720P60 as this mode has the fastest frame rate (**Figure 12**).

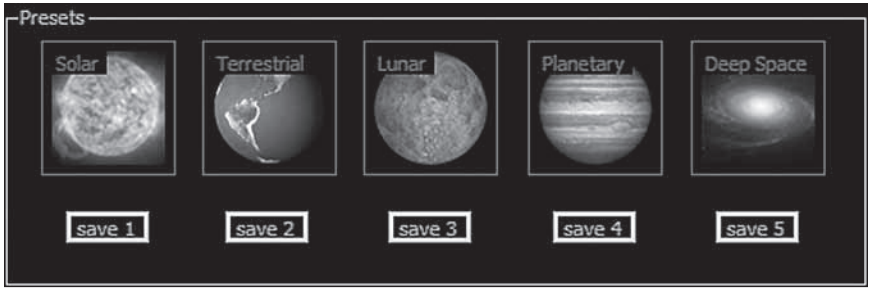


Figure 13. Presets.

Presets (Figure 13)

Quick Button Shortcuts

Five preset button icons are available as shortcuts to setting multiple parameters at the same time.

Pressing the icon button will set multiple parameters to enable quick setup times and helps tailor camera settings to best match user's telescope configuration.

Users can modify settings within the submenus and then press the save button for the software to assign current settings to that particular Preset button.

The settings that are saved and can be recalled via preset buttons are:

- ALC
- Fixed Shutter
- AES
- Slow Shutter
- AGC
- Peak Control
- Priority

Luminance Menu (Figure 14)

ALC – Auto Luminance Control

Auto Luminance Control (ALC) indicates the image sensor's ability to automatically adjust in diverse lighting conditions to yield the most vivid video image possible.

When ALC is active AES will be turned off automatically.

Fixed Shutter

When Fixed Shutter is active AES will be turned off automatically.

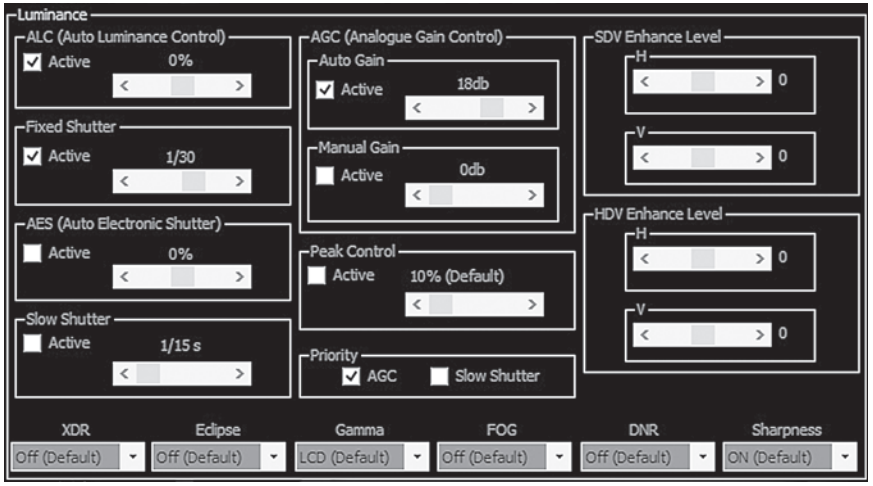


Figure 14. Luminance submenu.

When Fixed Shutter is active the following shutter speeds are available.

NTSC: (1/30s ~ 1/1000s)
1/30, 1/50, 1/60, 1/100, 1/120, 1/180, 1/350, 1/500, 1/750, 1/1000, 1/2000, 1/4000, 1/10000

PAL: (1/30s ~ 1/1000s)
1/25, 1/50, 1/60, 1/100, 1/120, 1/180, 1/350, 1/500, 1/750, 1/1000, 1/2000, 1/4000, 1/10000

Shutter speed should be selected to best suit the object being observed and the telescope being used.

For low light objects Fixed Shutter should be turned OFF.

AES – Auto Electronic Shutter (Rolling shutter)

AES is used when a manual or fixed iris lens is fitted and the shutter speed will respond to the amount of light to keep the signal at optimum level.

AES allows changing the iris level automatically without using the auto iris lens.

Note: AES is not normally used for astronomy.

Slow Shutter (Sense Up)

Sense-Up: An image processing technology which allows user selectable digital slow shutter speeds in order to allow extra light into a camera thereby providing higher sensitivity in low light conditions.

The minimum frame integration is 1/15 second for NTSC (1/12 for PAL).

The maximum frame integration is 8 seconds (NTSC and PAL).

Set Fixed Shutter SPEED (ALC) to OFF for sense-up frame integration.

For bright solar system objects such as the Moon and planets sense up should be set at a minimum or off and the fixed shutter speed should be set to the fastest speed possible to prevent blurring due to atmospheric conditions.

Low light objects require a high value sense up setting such as 8 seconds.

AGC – Analogue Gain Control

Select Checkbox to activate

Auto Gain – When Active use slider to modify gain

Manual Gain – When Active use slider to modify gain

Peak Control

Adjust Peak ratio for highlight suppression

Priority

Select between AGC and slow shutter

SDV Enhance Level – ADVANCED SETTING

Adjust sliders to enhance image

HDV Enhance Level – ADVANCED SETTING

Adjust sliders to enhance image

XDR

Dynamic range setting function based upon adaptive tone mapping

Eclipse

Used to block areas with saturated lighting

Gamma

Gamma Correction Function. Select according to viewing device.

FOG

Used to enhance low contrast image in foggy/snow weather conditions

DNR

Digital noise reduction (Off, Low, Middle, High)

Sharpness

Used to enhance image

Figure 15. The Color submenu.

Color Menu (Figure 15)

Color

Color Mode

Auto (Default) – Automatically switches between Mono and Color based upon the lighting conditions

Mono – black and white image

On – color mode activated

Off – same as mono

White Balance

AWB – Auto White Balance

AWB is a preset type function whereby white color in the scene is detected and white balance is automatically adjusted, then the setting status is stored. It automatically memorizes the adjusted white balance value every time the AWB button is turned on.

AWB is most suitable for environment with little change in light source.

Select checkbox and adjust slider as desired.

ATW – Auto Tracking Balance

ATW functions by detecting white color in the scene at a color temperature from 3200 to 10000 Kelvin. The color temperature is being monitored continuously and the white balance is set automatically by internal controller.

ATW is most suitable for viewing objects with changing color temperature and which can make the picture color look more natural.

Select checkbox and adjust slider as desired.

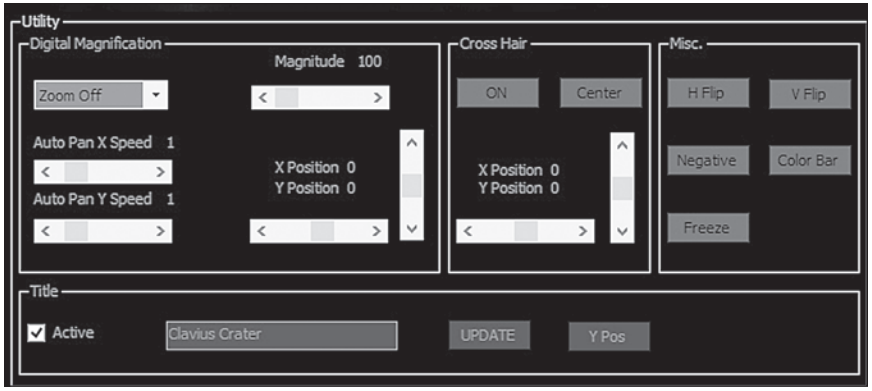


Figure 16. The Utility menu.

Color Suppress Level

Adjust slider to suppress unwanted color

Color Gain Level

Adjust slider to increase or decrease the color gain

Color Tone (R-Y, B-Y Color Space) – ADVANCED SETTING

Adjust sliders R-Y and B-Y to tune image

UV Matrix (YUV/RGB Conversion) – ADVANCED SETTING

U – Adjust R, G and B sliders to tune image

V – Adjust R, G and B sliders to tune image

Utility Menu (**Figure 16**)

Digital Magnification

Mode

Zoom Off – Turns off Digital Magnification

Zoom On – When active use Magnitude slider and position sliders

Auto Pan – When active use Auto Panning sliders to set speed of auto pan

Magnitude

When Zoom Mode is ON Adjust slider to adjust digital magnification.

Position

When Zoom Mode is ON adjust X Position and Y Position Sliders to adjust position of magnified view.

Auto Panning

When Auto Pan Mode is selected adjust the Auto X Speed and Auto Pan Y Speed sliders to control the speed of the panning search.

Cross Hair

When button active displays white cross hairs on screen to aid in centering target or to point to desired position on screen.

Select On button to activate.

Use X and Y sliders to position cross hair.

Press Center button to re-center cross hairs.

Misc

H Flip

When button active flips image in the Horizontal plane.

V Flip

When button active flips image in the Vertical plane.

Negative

When button active inverts image colors.

Color Bar

When button active displays color bars on screen to aid in tuning image.

Freeze

When button active freezes screen at the last frame and does not update frame until deactivated.

Title

Select checkbox to activate.

Click on text box and enter text (up to **22** characters long) then press **UPDATE** button to download text to camera and view text output on screen.

YPOS

Toggle **Y Pos** button to select screen Y position of text.

Using the Camera for the First Time

We recommend using the camera for the first time in daylight to become familiar with the software interface and camera settings.

1. Setup your telescope and use an eyepiece to locate an object outside that is 200 yards or more away.

2. Setup **SSHD** and viewing device as explained in viewing on TV or Computer section.
3. Remove the eyepiece and insert the **SSHD** (with 1.25" nosepiece) into the 1.25" eyepiece holder on your telescope.
4. If the image is white on the screen, it's overexposed. Adjust luminance submenu settings (ALC, Shutter speeds, Gain) as needed to reduce the brightness and blurring.
5. Focus telescope until you get a sharp image on your computer screen.
6. Experiment with the different camera settings. First use the presets to become familiar with each, then tune and resave each to get the best views for your particular telescope.

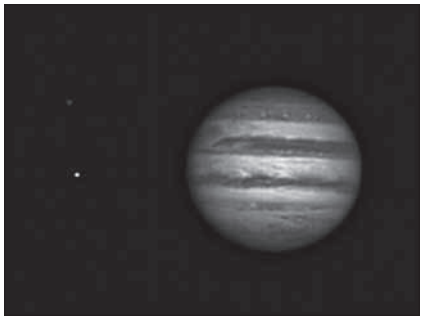


Figure 17. Planetary imaging. Jupiter and moons Io and Callisto.

Recording Video

The SD video can be recorded onto computer via the included Video Capture Device.

The HD video can be recorded onto computer via the Orion HD Capture Device (Sold Separately)

In order to capture video and use post processing software the video signal must be recorded onto your computer in a standard movie format.

Included with the **SSHD** is an SD video capture device. This device will record video from the SD output of the camera up to 720x480 (SD resolution) in uncompressed AVI format (See Video Capture Device instructions for details).

In order to capture the full resolution HDMI output signal a HD capture device must be used.

We recommend the Orion HD Video Capture Device (Sold Separately).

Planetary Imaging

Planetary imaging is also referred to as Solar System imaging, and includes the Moon, the Sun (with a proper full aperture solar filter!), the planets, and miscellaneous objects in Earth's orbit such as the International Space Station (ISS). The **SSHD** is capable of capturing all these objects in real time.

Just about any telescope is suitable for the **SSHD** when imaging the planets. The longer the focal length of the telescope, the larger and more detailed the images will appear. Unlike deep space astro-imaging, you actually want to have a long focal length and focal ratio for planetary imaging. Adding a 2x, 3x or higher

Barlow to the telescope to increase magnification is not uncommon for planetary imaging (**Figure 17**). The planets and other solar system objects are relatively bright and can be imaged with a darker or "slower" focal ratio.

High power planetary imaging often leaves the best focus up to your eyes when monitoring the live image. Use the digital zoom tool to aid in focus.

Use the fastest shutter speeds for your telescope and increase gain and other luminance settings as desired. Experiment with your telescope and camera to find the optimum settings for your particular setup.

The best planetary images will be obtained by aligning and stacking (combining) many individual images in order to improve image contrast, brightness, and detail.

A great way to obtain images for stacking is to take several seconds of video of the planet, then import the video into post processing software. Since the **SSHD** has a maximum frame rate of 50/60 frames per second, you can literally obtain hundreds of images for stacking in seconds! You save time by taking one video instead of dozens of individual pictures!

It is recommended to capture hundreds (or even thousands) of frames when planetary imaging. The large amount of frames can then be processed using stacking and aligning software such as RegiStax to give the best results.

Since you will be taking multiple images over a period of time, it is important you have a decent polar alignment in order to keep the planet within the field of view of the camera. To this end, having a motor drive (at least single-axis) will also be helpful. Otherwise, you will periodically need to rotate the R.A. slow-motion knob to keep the planet within the camera's field.

We recommend a telescope mounted on a motorized altitude-azimuth or German Equatorial mount. You can potentially capture the Moon or a planetary image with a telescope that does not track, however you may not get optimum results. The sky moves 15 arcseconds per second! If you are imaging through a long focal length telescope, you essentially need to track the object or unwanted blurring could occur.

Fainter objects will require longer shutter speeds whereas bright objects like Jupiter or the Moon will require very shorter shutter speeds. Adjust as needed for the object you are imaging.

Once you have achieved focus and good luminance and color, you are ready to capture and save images to your computer.

View and Stack

After you have captured your images, you can review them in RegiStax, a freeware program downloadable from the provided web link in the CD Launcher. Mac users can use the Lynkeos tool to align and stack their images.

We recommend stacking a minimum of 50 images or more. The individual images have low bit depth (255 brightness level counts), and background noise.

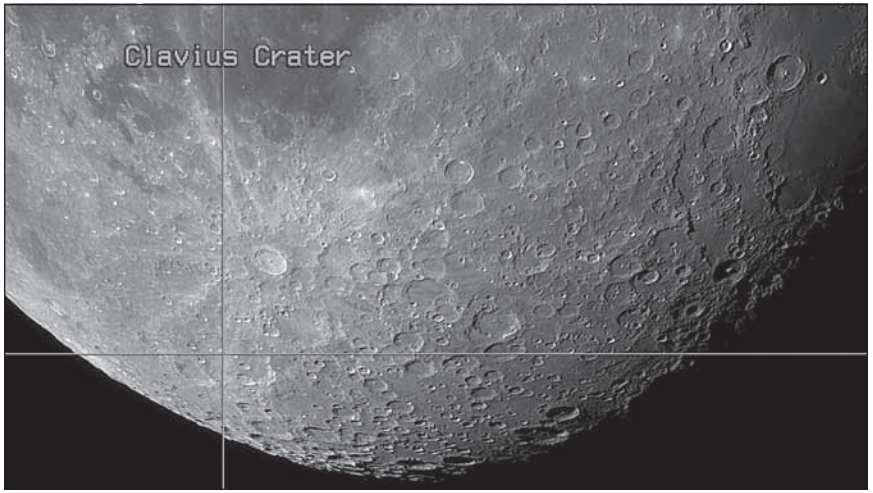


Figure 18. Lunar imaging.

Additionally, the individual images may be very soft since if you're imaging at high power, with or without the use of a Barlow. Stacking will improve the potential sharpness when processing in RegiStax. Stacking several hundred or more images is sometimes appropriate to get the most possible detail.

Lunar Imaging

Lunar imaging requires fast shutter speeds due to the high brightness of the moon. Similar techniques used to align and stack planetary images can also be used for lunar image processing. Full resolution Live Lunar images on a HD device can be stunning when imaged under favorable conditions (**Figure 18**).

The current phase of the moon will dictate the exposure setting due to the vast difference in brightness during each phase.

For group viewing use the text display and position cross hairs to point to craters or other features for your audience (**Figure 18**).

Solar Imaging

Warning: Always use a full aperture Solar Filter when observing the Sun.

With a properly fitting full-aperture solar filter attached to your telescope, you can use the **SSHD** to take images of the Sun and the sunspots on its surface.

(Filters available through Orion. Check the catalog or OrionTelescopes.com for more information).

Much like planetary and lunar imaging, solar imaging requires fast frame rates and shutter speeds.

Terrestrial Imaging

Nature and scenic imaging is possible with the **SSHD** when used with a telescope or wide field lens.

Use the X and Y flip when image is reversed or upside down.

When using with a telescope the aperture may need to be stopped down (reduced in size) in order to reduce the brightness during daytime.

Figure 19. NightSkiesNetwork.com.

Internet Broadcasting

When using the **SSHD** with the included video capture device it is possible to use services such as **NightSkiesNetwork.com**, **ustream.com, livestream.com** to show your views live across the internet to a worldwide audience. See websites for details.

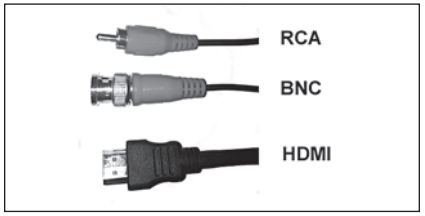


Figure 20. Cable types.

Connections And Cables

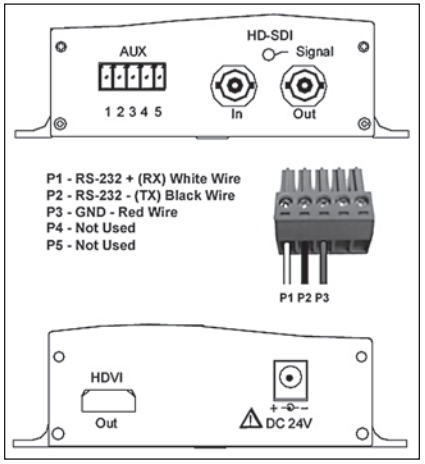


Figure 21. Connections to the HD Convertor Box.

Tips

Focusing

One of the hardest things to do in planetary imaging is achieving good focus. You can make this process easier by simply watching the Live Video window to focus. Depending upon the viewing conditions you may notice that the image goes in and out of focus, this is due to viewing conditions. This is to be expected and one of the reasons why post processing software can bring out the best in your captured images. Focus as best as possible with the average frame being at best focus to ensure more in focus frames than out of focus. Image processing software can then be used to

select the best frames to combine for best results and can also reject the poorest frames.

Use the digital zoom feature to aid in focusing.

First zoom in on the target, focus, then zoom back out.

Refocus often throughout your imaging session. This ensures at least some of your images will have an excellent focus. It is also not uncommon for telescope movements to alter the focus slightly, so be sure to refocus for any new astro-imaging targets.

Choosing a Site for Astro-imaging

Once you have a focused image, you may find your image shifting and washed out. This can be caused by many environmental factors. Poor seeing (movement of molecules in the air, such as heat rising) and poor transparency (moisture, smoke, or other sky contaminants) will all serve to reduce image quality. That is why most major astronomical telescopes are on high mountains in thin air, to get above much of the seeing and transparency problems. Also, wind will move your telescope and affect images. Your eyes viewing through an eyepiece can change slightly to compensate for disturbances like these, but the camera cannot. Keep these factors in mind when choosing an observing site for astronomical imaging.

For the best astro-images, we recommend finding a location with dry air, some altitude, and away from city or streetlights. Even a nearby hilltop in the countryside can provide better viewing conditions than many convenient backyard locations.

Using Focal Reducers and Barlow Lenses

Focal reducers serve to decrease the focal length of your telescope. This increases the field of view seen by the camera (decreases camera magnification). This can be useful for obtaining images of wider objects, such as the full Moon or a landscape vista.

Barlow lenses, or other tele-extenders, increase the focal length of your telescope, which makes the camera field of view narrower (increases camera magnification). This is useful for high-power planetary images. Keep in mind that when the focal length is doubled, the image will become four times dimmer, so a longer exposure may be necessary.

For best planetary imaging, you should shoot with an effective focal ratio (telescope focal length ÷ telescope aperture) of f/20 or greater. This will give you a good combination of image brightness and image scale for planets. For most telescopes, a Barlow lens will be required to obtain this focal ratio. For example, Schmidt-Cassegrain telescopes usually have a focal ratio of f/10. A 2x Barlow lens doubles the effective focal length of the telescope, which makes the focal ratio f/20. Similarly, a 3x Barlow lens will yield of focal ratio of f/30. You can also try using multiple Barlows to obtain even greater effective focal ratios. There is a limit to how large a focal ratio your telescope and seeing conditions can handle,

however. Experimentation will be needed to see what your telescope is capable of in the seeing conditions on a given night. If the image appears somewhat dim and fuzzy on the computer screen, you may want to consider removing the Barlow lens.

(Focal Reducers and Barlow lenses available through Orion, check the catalog or OrionTelescopes.com for more information).

Solar Filter

Warning: Always use a full aperture solar filter when viewing the sun.

With a properly fitting full-aperture solar filter attached to your telescope, you can use the **SSHD** to take video of the Sun and the sunspots on its surface.

(Solar filters available through Orion, check the catalog or OrionTelescopes.com for more information).

Flip Mirror

As easy as flipping a switch, the Imaging Flip Mirror enables the astro-photographer to find, center and focus a target visually with a 1.25" telescope eyepiece, then photograph it with a camera. All without swapping out any equipment. It's a real timer saver, making the normally tedious task of focusing with the camera alone easier and quicker. (Available through Orion, check the catalog or OrionTelescopes.com for more information).

Care and Maintenance

When the **SSHD** is not in use, remove the nosepiece then attach the dust cap. This prevents dust from accumulating on the **SSHD's** optical window. The optical window should only be cleaned if significant dust builds up for if the window is touched. Any quality optical lens cleaning tissue and optical lens cleaning fluid specifically designed for multi-coated optics can be used to clean the glass surface of the **SSHD's** optical window. Never use regular glass cleaner or cleaning fluid designed for eyeglasses. Before cleaning with fluid and tissue, blow any loose particle off the surface with a blower bulb or compressed air. Then apply some cleaning fluid to a tissue, never directly on the optics. Wipe the optical surface gently in a circular motion, then remove any excess fluid with a fresh lens tissue. Use caution, rubbing too hard may cause scratches. (Cleaning products available through Orion, check the catalog or OrionTelescopes.com for more information).

SSHD Manual Menu

Luminance Menu1/4		
ALC	Off/On/FLC	ALC(Auto lighting control) level control, with FLC(flicker less) function
AES	Off/On	AES(Auto exposure shutter) level control
FIXED SHUTTER	Off/On	1/30(1/25),1/50(1/60),1/100,1/120,1/180,1/350,1/500.1/750,1/1000,1/2000,1/4000,1/10000.
PEAK AVERAGE	Off/On	Adjust image PEAK ratio, for highlight suppression
BACK LIGHT	Off/On	Brightness compensation for dark area
XDR	OFF/LOW/Middle/HIGH	Digital WDR function which is based on adaptive tone mapping.
GAMMA CONTROL	CRT/LCD/1.00	Gamma correction function
Luminance Menu2/4		
AGC	AUTO/FIX	Electronic sensitivity compensation which can amplify to enhance low video signal up to 36dB
SLOW SHUTTER	OFF/LIMIT TIME	Electronic sensitivity compensation which be by frame accumulation tech.
DNR	OFF/LOW/Middle/HIGH	To reduce random image noise
DAY / NIGHT	DAY/NIGHT/COMPUL	ICR-SET, Control mode: auto or by External control mode
FOG REDUCTION	OFF/LOW/Middle/HIGH	To enhance the low contrast image such as snow, fog, haze
ECLIPSE	OFF/LOW/Middle/HIGH	To block the area which is saturation of lighting in the image.
SHARPNESS	ON/OFF	Image enhance
ENHANCE	HDV/SDV	Both HD(high definition)Video and SD(standard definition) video can be adjusted by Horizontal and Vertical

Color Menu3/4			
COLOR MODE	MONO/OFF/ON/AUTO	Be changeable from color to B/W automatically or fixed in color	
WHITE BALANCE	ATW/AWB	Auto tracing white balance and auto while balance –one push	
UV MATRIX	U-MATRIX/V-MATRIX	U or V- axis, R/G/B color adjustable.	
COLOR GAIN	GAIN CONTROL	Color gain adjustable.	
COLOR TONE	R-Y/B-Y	Color vector adjustable.	
Setup Menu4/4			
LANGUAGE	ENGLISH/JAPANESE/CHINESE(TRADITIONAL/SIMPLIFIED)		
TITLE	OFF/ON	TITLE can be set with display.	
DEFAULT	LOAD/SAVE/FACTORY	OSD parameter setting load or saving	
SPECIAL FUNCTION	SPECIAL FUNCTION (1/2)	PRIORITY	Priority selectable, AGC first or SLOW SHUTTER first.
		MOTION DETECT	Motion detection is on or off
		DIGITAL ZOOM	Zoom ration selectable, and Pan / tile movable
		H / V REVERSE	Mirror and flip
		DISPLAY MODE	HD video format: 720p25/30/50/60;1080p25/30;1080/50/60 selectable by OSD or PC SD video format: 4:3/16:9 Image aspect : Nor.(16:9) or Full(4:3)
		DIGITAL OUT	YUV422 Spec. setting
	SPECIAL FUNCTION (2/2)	PRIVACY MASK	Image masking
		CROSS LINE	Crossline can be displayed with moving by V or H axis
		FREEZE	Image freeze
		COLOR BAR	Color Bar can be displayed
		POSI / NEGA	Show positive image or negative
		COMM ID	Set camera ID number for comm.

Specifications

Camera Sensor:	Sharp color CCD Sensor
Sensor format:	1/3"
Resolutions:	1920 x 1080 1280 x 720 720 x 480
Pixel Size:	3.75µm x 3.75µm
Exposure Range:	1/10000s to 8s
Frame Rate:	Selectable 30/60 FPS
A/D Conversion:	16 bit
IR Cut filter:	Yes
Mounting:	1.25" nose piece

One-Year Limited Warranty

This Orion product is warranted against defects in materials or workmanship for a period of one year from the date of purchase. This warranty is for the benefit of the original retail purchaser only. During this warranty period Orion Telescopes & Binoculars will repair or replace, at Orion's option, any warranted instrument that proves to be defective, provided it is returned postage paid. Proof of purchase (such as a copy of the original receipt) is required. This warranty is only valid in the country of purchase.

This warranty does not apply if, in Orion's judgment, the instrument has been abused, mishandled, or modified, nor does it apply to normal wear and tear. This warranty gives you specific legal rights. It is not intended to remove or restrict your other legal rights under applicable local consumer law; your state or national statutory consumer rights governing the sale of consumer goods remain fully applicable.

For further warranty information, please visit **www.OrionTelescopes.com/warranty.**

Orion Telescopes & Binoculars

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